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Article abstract

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In the industrialized countries, the last twenty years have seen an intensifying of research and debate about the labour process as it manifests itself within firms. Dugger (1987), for example, has argued that with a decline in the scope of market transactions and an increase in the presence of bureaucratic exchange, ways of contending with the substantive and theoretical problems created by expanded corporate structures have been necessary. As a result of this, there has been increased interest in the internal processes and structures of organizations on the one hand, and on the effects within organizations of exchanges between organizations and their environments on the other. In particular, researchers have begun to look more critically at the effects of Taylorism, or scientific management and hierarchy, on efficiency, on quality of output, and on the quality of working life among workers. Three points of view in particular seem to stand out as representative of the different ideologies applied and perspectives taken on these issues.

Among class-based and structuralist researchers, stimulated largely by the publication of Braverman's *Labor and Monopoly Capital* in 1974, debate has focussed especially on how skill levels in the evolving division of labour mediate the relationship between workers and employers where their interests are assumed to be contradictory (e.g., Wood, 1987; Maton, 1987). The creation of surplus value in the firm is presumed to take precedence over any needs the workers may have, and so from this viewpoint the determining question for managers becomes not how can workers' needs be met,

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but rather which available form of control is most effective at maximizing profit for the owners of the firm (e.g., Benson, 1977; Francis, Turk and Willman, 1983; Clegg and Dunkerley, 1980). Workers with low skill levels in Taylorized, hierarchical and relatively non-complex production processes tend to resist such control «subversively», i.e., they tend to raise the costs to employers by systematically undermining the processes and structures purported to maximize technical efficiency and product quality in the firm in order to benefit themselves (e.g., Cousins, 1987). In contradiction to the efforts of the firm to control workers through hierarchy, their greater reliance on each other in the work process and the tendency to cluster them together to create efficiency leads to their being better able to resist control.

Alternatively, in more complex or idiosyncratic production processes, where skill levels are higher, workers are often increasingly socialized towards internalizing the expectations of the organization. Control comes from within workers subjectively as well as from their environment. Hierarchy will therefore become less of a controlling factor, job boundaries will blur, and worker influence over the work done will potentially be greater. Nevertheless, this also inevitably gives rise to contradiction. Assuming again that there is a significant objectifiable conflict between their interests and those of the firm, workers under these conditions are much better able to assert their needs than unskilled workers because of the dependence of the firm on their relatively scarce skill (Bowles and Gintis, 1986). This is of course risky for the owners of the firm. Therefore the form of the contradiction between worker demands and capitalist requirements — though not the substance — will take a slightly different shape, depending at least partly on the skill levels of the employees involved, the power balance between employers and employees, and the relative ways that work is organized in order to contend with complexity.

The neo-classical theory of the firm, on the other hand, reflected most notably in the neo-institutionalist ideas of Williamson (1975; 1985) and Ouchi (1980), in some ways differs sharply from class theories in how it conceptualizes the labour process, but in others it is remarkably similar. One crucial similarity is an emphasis on the determinism of natural laws and self-interested rationalities in the development of social institutions under capitalism. Social relations determine the form of institutions as well as technologies. Many of the differences, on the other hand, may be reduced to the level of norms based on competing conceptions of human nature. That is, while class-based writers propose that workers are pre-disposed to altruistic social commitments, and should therefore control their work and the workplace in the interests of democracy, neo-institutionalists think that people are essentially opportunistic, i.e., self-interested with guile, or

greedy and dishonest. Therefore, contracts should govern exchanges, and the substance of these exchanges should be governed essentially by technical cost-benefit criteria. In addition, contracts require monitoring and enforcement to ensure that they are carried out according to their intent. Authors using this framework argue that the form taken by an organization (market, bureaucracy or clan) will be determined by its efforts to reduce its costs of negotiating, monitoring and enforcing its contracts. These costs are referred to as transaction costs. Power becomes a trivial concern, while complexity of transaction processes and uncertainty about contract performance determine the form taken by the organization in its efforts to control its contracting costs.

A third theoretical strand offering tools towards the analysis of firms is institutionalism, whose traditions converge from many directions, but particularly from Commons and Veblen in the U.S., and from Keynes, Alfred Marshall and Polanyi in other constituencies. Institutionalists tend to reject the determinisms of both class and neo-classical ideas, replacing them with notions of evolution, culture, cultural relativity, and instrumental valuing (Mayhew 1987; 1987a, p. 973). In many ways related to the tenets of functionalist anthropology, these theories have emphasized human and cultural diversity as a resource for positive change; the abandonment of natural laws in human development; and positive evolutionary change through beneficial social and economic policy reform. Determinisms are replaced with notions of choice and intention in individual and collective decisions. Ends/values and the instruments required to achieve them are put into place by human decision and are essentially teleological (de Bresson, 1987); however, the direction of the future in any particular culture is not predictable because of the complexity of interactions among variables and the dependence of present choices upon past decisions. The ends/values which in this purview should be pursued, i.e. through social policy interventions, are generally consistent with liberal ideology. They are freedom, equality, security, abundance, excellence and democracy (McClintock, 1987, p. 678). These values tend to lead to policy proposals which support, for example, full employment in the economic environment and worker participation and economic democracy in the firm.

The Socio-Technical Systems (STS) approach to organizational design shares many features with the institutionalist approach. It has been offered by many progressive business researchers as an alternative to the historically much more dominant Taylorist bureaucratic organizational form. From its beginnings in the early 1960s, STS adherents have been concerned simultaneously not only with (like Taylorism) optimizing organizational efficiency but also, unlike Taylorism, with framing a humane and needs-

fulfilling social organization of production (Trist, 1981, pp. 7-12). However, similarly to some other institutional theories, despite its clear attraction for both workers and managers as a humane way to increase efficiency, acceptance of this framework in firms has been quite limited. Taylorism maintains its dominance, even though the complexity of much new technology places increasing strains on efficiency as the Taylorist tendency to simplify (i.e., «deskill») and divide tasks up fails to match the organizational requirements either for effectively using the technology (e.g., Braverman, 1974; Manz and Sims, 1986), or for motivating employees (e.g., Leibenstein, 1976; 1987).

This essay will explore possible reasons for the resistance by both workers and managers to introduction of the STS approach, despite its apparent benefits to both. The argument will be presented from an institutionalist perspective, and will take the position that even though essentially STS purports to balance and equilibrate worker needs with the capitalist requirement for profits, without some crucial changes both to its conceptual framework and to its record of implementation, it cannot succeed. The main problems are that the approach does not supply enough conceptual substance to be able to maintain consistency in its direction and application; that what conceptual substance has been developed is undermined by confusion and contradiction; that a characteristic weakness is that it fails to contend with social variables in the environments of firms which might affect its outcomes; and that even more fundamentally any commitment to a balanced approach to responding to both technical requirements and human need simultaneously is unrealistic. A priority of one over the other is necessary, and each option for preference has implications for the employment relationship. Essentially, for STS to be successful, human needs must take priority over technology. For STS to have any chance of success among workers it must meet their needs. However, for it to succeed among employers its benefits must exceed the benefits of other alternatives to work organization. According to long-established planning rationalities, especially in North America but also elsewhere, commitments to worker needs imply incompatibility with commitments to increased efficiency through improved technology. This is partly because new technology replaces workers and therefore often contributes to unemployment in the firm's environment, and partly because workers have not always benefitted either materially or qualitatively from technological substitutions within firms. It is argued here that this conflict between the requirements of technological efficiency versus the needs of workers is the main reason why STS has failed to take hold in North America. The issue is one of trust between employers and workers that cost-reducing technology will be chosen by workers, as an

expression of their human needs, if power to decide on the issue is acquired by them. As suggested, the discussion will proceed with particular reference to the North American economy.

SOCIO-TECHNICAL SYSTEMS

The major goal of STS organization has been «joint optimization», or the mutual matching of technical and social systems requirements in organizations in order to maximize organizational efficiency, flexibility and adaptability. STS was developed in the face of turbulent industrial environments, increasing market uncertainties and progressive losses of the conventional Taylorist means available to control and motivate organizational members because of technological advances, an increasingly sophisticated workforce and more democratic social norms (e.g., Davis, 1983, pp. 65-70).

In STS theory, the complexity and turbulence of organizational environments can be controlled more effectively by increasing the quality and lowering the cost of product as it passes through the production process (e.g., Taylor and Asadorian, 1985, p. 6). On the technical side, this means controlling the «key variance», which are defined as the most crucial and vulnerable production variables and stages in putting out good quality material. In the social dimension, the optimal allocation of responsibilities to people for ensuring quality is made the most important focus of organizational structures and relationships. In general, this is accomplished by giving the operator or worker ultimate responsibility for quality as an inherent part of the production task rather than separating out a monitoring function from the task and allocating it to inspectors or managers, as Taylorist organization would have it. Therefore, while workers are given more responsibility, including the integration within their jobs of more ability to monitor and control production, also the Taylorist process of labour division is ostensibly reversed, and the need for quality control and monitoring external to the worker/operator is eliminated or reduced significantly. This purportedly creates more work satisfaction while it also symmetrically increases output quality and lowers the labour costs involved in monitoring quality and speed.

An important dimension of creating a satisfying work organization has been the installation of cooperative work groups and expanded job definitions (i.e., «job enrichment») which purportedly reverse the degradation and deskilling of work normally accompanying the Taylorist division of labour. STS promises outcomes of production efficiency and effectiveness;

greater commitment to organizational goals on the part of employees through more democratic participation in workplace decisions; improved ability by organizations at dealing with complex and uncertain production, distribution and transaction processes; increased consensus and lowered conflict in the organizational climate; and higher quality of working life (QWL) by taking into account the needs and articulated requirements of employees in the design and implementation of organizational structures and practices.

However, as previously discussed, the optimistic claims made for STS in improving industrial cooperation, worker satisfaction, efficiency and effectiveness belie the reactions to it of the participants in the international economy. Despite nearly thirty years of apparent success in transforming the production processes in some firms, STS is arguably still not embedded in economies in a substantial way. Although some observers are optimistic that it shows signs of growth, and point out local firms where it has been implemented recently (e.g., Kolodny, 1987, who describes an example in a Canadian General Electric firm in Toronto), still others propose that its decline has set in permanently (Morton, 1987; Wells, 1986; Kelly, 1985, p. 30). Morton, a Canadian, notes that none of business, labour or government in Canada appear to have the enthusiasm for STS that they demonstrated in former years, especially in the 1970s and early 1980s. For example, he expects that the Quality of Working Life Center in Toronto, an important government-funded advocate of STS, will eventually go the way of its scrapped federal confrere in Ottawa, «an easy victim of Tory budget cuts» (Morton, 1987, p. 43).

WAYS OF UNDERSTANDING THE LOW POWER OF STS

Three ways at least can be suggested as possible means of understanding or explaining the low power of STS among firms. The first, essentially political, suggests that STS has been a victim of contests between the interests and ideologies of managers and workers in firms. This view is related to both the institutionalist and the class-based theories outlined above. Barkin (1986; 1987), for example, has explained the present direction in industrial relations in Europe and North America as a largely successful drive by managers to reestablish their rights over personnel and wages relative to unions. Where unions do not exist a similar process is also occurring, but which generally encounters less resistance. Barkin's work suggests that the ideological commitment to bureaucratic and Taylorist control of work methods among managers is overwhelmingly powerful. Such controls are viewed by managers as worth maintaining even where they produce ap-

parent losses in productivity (Barkin, 1986). The priorities of this drive for management supremacy do not make such new stratagems of labour relations as STS so viable as they would likely become in a less adversarial climate. Rather than creating or improving on cooperation in labour relations, STS often appears to depend on its pre-existence. In addition, some authors are suggesting that STS may only work in creating humanistic efficiency in new or «greenfield» organizations, which have no history or cultural traditions to create inertia (Kolodny, 1987). However, whether it is the absence of an organizational history of adversity which is important, whether it is the institution of an STS kind of culture right from the start which predicts success, or what the precise conditions are which predict the successful installation of STS mechanisms, remains to be tested in the STS literature.

The second field with explanatory power regarding the relative absence of STS among firms is political economy. Such authors as Morton (1987) explain the success of managers in propagating their rights as at least partly due to recession and higher unemployment levels since the mid-1970s. The increased ability of managements to limit and even scuttle worker demands because of labour market conditions has led to expectations among managers that cost reductions through tighter labour control and increasing socialization of the costs of production through unemployment are the best ways to improve profits (e.g., also Barkin, 1987). Countering this thrust has been an increase in resistance by workers and unions, who perceive the Keynesian social contract of full employment in exchange for moderate union demands, manifested after World War II, to have been largely scrapped (e.g., Gonick, 1987, pp. 73-102). These phenomena are suggested by many writers to have led to an increase in adversarial relations between capital and labour at the society level. STS adherents, in supporting their case, suggest that such adversity and conflict is not an optimal precondition for efficiency since it does not reckon with the evolving needs and expectations of increasingly educated workers dealing with complex tasks (e.g., Trist, 1981). Certainly it does not set the preconditions for successful STS programs, which (evidence suggests) depend ultimately on a climate of trust, loyalty and close identification with the goals of a firm among its workers, who must be guaranteed some job security with an organization (i.e., a relatively long time horizon) before a strong commitment is made (e.g., Axelrod, 1984). Alternatively, it seems clear — especially when taking into account the experiences of societies such as Sweden, for example (e.g., see Mishra, 1984; Kuttner, 1984; Korpi, 1983) — that a commitment to full employment at the level of the state might provide the soil for similar commitments in loyalty by workers. The STS literature fails to contend with such variables as levels of unemployment in the environment and its impact

on the viability of STS. Rather, it seems to be assumed that the growth created by the improved efficiencies resulting from STS will generate adequate employment for any displaced workers within a firm (e.g., Kolodny, 1987). As will be discussed in this article, in the absence of very much evidence for efficiency increases from STS, such assumptions are problematic.

Although both of these approaches offer substantial insights into the low level of acceptance of STS, neither seems to explain adequately why the STS approach has not taken off in its impact. We return to the question why, given its theoretical and proved benefits both economically and politically to both workers and managers, is it not more popular? Why do managers choose Taylorism even where it apparently *lowers* efficiency, and why do workers resist STS who would otherwise seem likely to benefit? Why does trust not develop more often? Although as Kelly says, judged by the numbers of jobs «enriched», STS may not be a very significant movement (1985, p. 30), theoretically it is important because it constitutes a critical test example for exploration of the relation between theory and the labour processes occurring in the economy on the micro, meso and macro levels.

CONCEPTUAL VARIABLES IN PROBLEMS WITH STS: ONE APPROACH

The focus of examination in this section, i.e. the conceptual basis of STS, suggests that its promoters may have such high difficulty in overcoming internal dilemma, conflicts and contradictions inherent in its praxis as to make it less attractive. Unfortunately, this is an area which has not been explored very much in the STS literature. Manz and Sims (1986) broach one such issue in an article exploring the «paradox» which often occurs of (nominally) autonomous work groups requiring some form and level of external controlling leadership. However, it is not acknowledged by these authors that nominal group autonomy and controlling leadership from outside would seem to be incompatible dynamics. The labelling of externally controlled but supposedly autonomous work groups as a conceptual «paradox» appears to miss the point. Rather, to the extent that workgroups rely on autonomy for their generation of benefits to workers and the encompassing organizations, while simultaneously being subject to significant external control, the processes of these groups seem essentially in contradiction. Although such research recognizes these problem areas on some level, it generally apologizes for, or otherwise fails to contend with them as major incongruities. Issues such as this would seem fundamentally problematic to the internal cohesion of the paradigm rather than merely paradoxical; the

argument to be developed here in part is that this kind of contradiction and confusion likely reduces its acceptability to all the parties involved in production.

The main difficulty can be summarized conceptually in the following way. An organizational paradigm which espouses greater democracy and participation for workers as a means of *controlling* them more effectively, while also embracing increased technological adaptability to highly important social and human needs as a way of enabling organizational conformity to rapid and inevitable *technological* change seems to be in a state of at least conceptual confusion and ultimately contradiction. Most STS authors advocate in theory a more or less «reflexive» or «dialectical» approach to the matching of social systems needs and technology requirements in STS design, in which both carry more or less equal weight and where both are adapted to each other in a balancing kind of process (i.e., a process similar to «point, counterpoint, synthesis»). However, in practice the limits on both the possible levels of participatory democracy for employees and also on what efficient technological alternatives are feasible in order to meet social and human needs have been fairly narrowly restricted (e.g., Rothschild-Whitt and Whitt, 1986; Rothschild and Russell, 1986). This argument will be developed further in proceeding sections.

THE DOMINANCE OF THE «TECHNOLOGICAL IMPERATIVE»

The emphasis of the paradigm on efficiency suggests that the STS-governed process of discovering and meeting employee needs until now has been tightly constrained by the technological/technical imperatives. For example, nearly all research in the field has concentrated upon the impact of STS norms and technology on the behaviour, interactional patterns, attitudes and effectiveness of organizational members in the context of a (broadly-defined) given technology (e.g., Trist and Bamforth, 1951; Kolodny and Kiggundu, 1980; Taylor and Asadorian, 1985). Technology and technique, on the other hand, have not been the subject of very much study as dependent variables subject to human variation. This may be because technology and technique usually (though not always) have an impact on efficiency which is too large to make the introduction of technology contingent on factors such as work organization, *ceteris paribus* (Wood, 1987, pp. 3-11). Hence work organization becomes the dependent variable. At the same time, there are many reasons economically and technically why a particular mode of organization of human factors may be the most efficient one when technology is held constant (e.g., Wood, 1987, p. 3). Choices of organization will therefore become contingent on maximizations of effi-

ciency rather than independent, as the transaction cost theorists argue. As Nightingale suggests (1982, pp. 235-7), STS in practice (if not in theory) generally adjusts human factors to a fixed technical system. Therefore, the technology seems normally to be taken pretty much as a given in STS, while the thrust in allocating personnel has been the adjustment of employees towards meeting technical requirements, i.e., a homogenization, or at least a reduction in variation, of their characteristics. This aspect — the impact of STS on the population involved — will be explored in more detail later.

Similarly, where technical innovation has been planned to meet human (as opposed to pure efficiency) needs, it has been relatively restricted, arguably perhaps even trivial. In illustration are the technical innovations described by Halpern (1985) which were installed in a new oil refinery with the intention of enabling better communication among various role-players in production. These consisted of merging two control centers into a single facility (even here concessions to technical factors intervened in the optimal social design); planning the social relationship implications of the location of a parking lot (equality was served symbolically by parking everyone inside the plant gates rather than parking lower status employees outside); and organizing various facilities such as lunch rooms and washrooms so that, once again, individual status was de-emphasized. It might be argued that such adaptations can serve to obscure the reality of social relations rather than move them towards equality. However, the main criticism here is that technology seems to dominate in degree rather than in kind. Clearly, a wide scope for significant *technological* adaptations to *social* needs (rather than vice-versa) are not reflected in such STS projects.

HOMOGENIZATION OF HUMAN RESOURCES IN FIRMS AND SOCIAL CONFLICT

This outcome is consistent with a further way of avoiding meeting human need: the clearly articulated preoccupation in STS with organizing human resources and obtaining their consent through careful employee selection, the subsequent induction of values among them which are congruent with the organizational culture, and socialization of employees to meet technological needs (e.g., Cherns, 1976, p. 784). The intended result is clearly reduced variation among employees in their characteristics of values and ideologies as a precondition of efficiency (Locke et al., 1986, p. 78), rather than an effort to substantially adjust technology to meet human needs.

Since this is so — and the discourse has yet to take this into account by all appearances — the STS paradigm raises the question of a further inherent conceptual contradiction. Experience in production will be influenced by the qualitative characteristics of technology as well as by its quantity (e.g., Grant, 1969; 1986). Since the STS advocates are concerned about promoting democracy, the research into STS outcomes should account for technological effects on the meaning of democratic principles both within organizations, where increased congruences among employees through such selection and socialization as described previously here will doubtless lower conflict and give the appearance of democracy, but also within the wider society, since as we know, what happens in institutions has a profound effect on their surrounds and vice-versa (e.g., McClintock, 1987). One of the strongest theoretical arguments for the conjunction of liberalism and democracy in institutions in our society has been the resultant nurturing of human and institutional variation, fostered by the liberal capitalist form of democracy and by individual and collective freedoms, variations which are assumed to make evolutionary change in (for example) economic institutions more possible so as to enable the society to meet new and unpredicted social conditions (see, e.g., Dahl, 1982; 1985). Otherwise liberalism and democracy are viewed in much theory to be quite in contradiction (e.g., Bell, 1976; Macpherson, 1973). The cultivation of a relatively narrow range of values and skills arising from the present thrust of the accumulating technology by powerful institutions may therefore be in practical terms self-limiting. There are at least three reasons for suggesting this.

First, resistance to STS by those perceived to be excluded from its benefits because of their incompatible values or ideologies, or because of their low level of skill, may arise. One example of this for illustrative purposes is the growth of Green Parties in Europe and North America, which on the whole view the present growth and direction of technology very skeptically and even as unacceptable. Another is the reported increasing gap in incomes and social legitimacy between those who have sophisticated skills in the labour market and those who do not (Braverman, 1974; Maton, 1986). STS generally accepts technology as it is, and is formulated arguably as a response and as a facilitator not only to the quantity of technology (if technology can be «quantified» in such a way) but also to its qualities and direction of growth. In this way, by facilitating divergences between the employed «haves» and the «have nots» in areas of skill, i.e., between those able to use the technology and those who are unable, STS can be viewed as a contributor to social antagonisms to some degree, and as such will no doubt generate resistance in much the same way that other paradigms such as Taylorism already do.

Second, the inherent narrowing of consciousness and flexibility brought about by the socialization process in STS organizations seems — in contradiction to the major rationale for implementing STS — likely to build in a deteriorating ability to cope with changing conditions. For example, if the economy began to reward initiative, entrepreneurship and individualism more highly in (for example) an increasingly complex and decentralized institutional setting, how would those trained in an STS environment manage? Although STS teaches skills of cooperation and flexibility of response, it seems questionable whether it teaches initiative and creativity outside of certain boundaries set by the technology and by those homogeneous and restrictive social relations already in usage. As discussed, the STS priority is mainly towards adjustments by people to technology rather than the opposite. In this way the thrust of STS appears, metaphorically, much more Appollonian and rationalist than it appears Dionysian and creative: much more bureaucratic than entrepreneurial. Since increasing needs in industry for flexibility and responsiveness — and even a degree of creativity — are the reasons for the development of the STS paradigm in the first place, its possible limitations in initiating and generating variation as evolutionary facilitators of flexible response to changing conditions seems a highly problematic potential contradiction.

Third, we return to the more abstract question of whether democracy as a repository of freedom, broad collective and individual scope of action, and tolerance for wide variation, is served by STS, as its adherents assert. Those who support it for these reasons appear to see no contradiction between democracy and STS principles of socialization, consensus and relative homegeneity in human ideological commitments. Although the issue is extremely complex and inappropriate for much discussion here, there is no reason to suppose that consensus is the same as democracy (as, for example in an extreme case, the growth of fascism in Europe in the 1930s indicates). The technological imperative, powerful in its impact on the direction of STS thinking and implementation, raises cause for concern that the democratic principles as practiced in STS may in fact lead to the undermining of those very principles. There is an implicit danger of «moral relativism» in STS, an idea which suggests that the greatest good is what most people want, in the STS case with its implementation in any given organization (for further discussion see, e.g., Grant, 1969; 1986). However, given the power of socialization, the required selection of employees for homogeneous characteristics, and the necessary conformity to behavioural and value standards in STS (which are enforced by «the work group» rather than by supervisors as such), the «good» must be founded on stronger principles than mere consensus, or else goodness becomes a product of indoctrination and artificially created homogeneity rather than «truth». The principles of democracy seem likely to suffer under such conditions.

Recently, there have been some attempts to identify and specify in general terms the technical conditions under which efficiency and productivity can be improved with the introduction of STS norms of participation and satisfaction (e.g., Locke, Schweiger and Latham, 1986; Miller and Monge, 1986; Davis, 1983, pp. 76-78; Cherns, 1976). However, no clear prescriptive guidelines — apart from those discussed above suggesting that a clean slate historically seems to make it work — have so far emerged. A further review of the discourse also reveals incipient paradigmatic conflict along the lines suggested by this analysis. As indicated earlier, STS has been described (nearly always) as an efficiency-promoting way of dealing with the uncertainties and complexities of advanced technology. However, occasionally writers emphasize the normative and/or ethical benefits to be reaped from STS whatever the effects on technical efficiency might be. Some have even suggested that human need should take precedence whatever impact this might have on efficiency (Mumford, 1983; Sashkin, 1984; 1986). These different approaches, one emphasizing technology, the other human needs, serve to demonstrate the emerging tensions in STS between fulfilling human and technical requirements in order to optimize efficiency. They even appear to hold to different definitions of efficiency — the technical imperative to a more neo-classical definition of optimal resource utilization, and the human needs priority to a more institutional or evolutionary priorization of equity and justice (e.g., Weiermair, 1984; 1986; Klein, 1984; 1986). However, the conflict at this point seems to be carried out more at an empirical level than conceptually, i.e., the questions which are raised about the effects of STS on work involve reviews and interpretations of research, which not surprisingly (from the perspective presented here), seem to provide few answers. It appears that the normative approach suffers loss of legitimacy by being unable to prove that efficiency gains are possible by emphasizing human needs over technology. The question until this point in time appears to have been asked at a conceptual and normative level without having progressed to a positive test. Until this conceptual conflict is worked out so that a test of an organization in which needs clearly predominate is possible, the STS paradigm appears bound for decline, since its most powerful advocates will likely persist in suggesting that both human needs fulfilment and efficiency are essentially necessary for its survival, while failing to acknowledge that this position may be untenable under present conditions.

However, to the degree that there is consensus within STS, the principles governing social organization within the paradigm are deeply believed and relatively well-defined, likely making such conflicts, and investigations of them from within the STS paradigm itself, highly problematic. For example, since these conflicts seem to rise directly to the surface of discourse

so rarely, this may possibly be a result of its crucialness to the survival of the paradigm as (nominally at least) fundamentally committed to human fulfilment. It is difficult to suggest at one and the same time, as is implicit in the research conducted so far, both that STS is valuable because a main priority is the improvement of the quality of workers' experience, but also that it may be counter-productive economically and therefore inadvisable under some circumstances. In fact this may be what has happened to provoke worker resistance to the paradigm, as was discussed earlier.

IS STS AN ALTERNATIVE TO, OR A MUTATION OF, TAYLORISM?

A further conceptual problem which is suggested by the discussion so far is that the presentation of the STS paradigm as clearly an «alternative» to Taylorism may be over-simplistic and also open to criticism. Wood (1987, p. 6), for example, proposes that theoretical alternatives to Taylorism often incorporate within them some crucial features of Taylorist thinking which are disguised and make them difficult to differentiate. One such example may be the emphasis on technology over human need in STS. Another example is that the ideologies of managers and engineers trained in Taylorist methods and values may interfere with the installation of new participative ways of organizing work (Armstrong, 1984). Also, as Wood (1987, p. 6) argues, the particular characteristics of an industry, technology or factor and labour market system may lead to different ways of organizing production which have as much to do with their particular circumstances as they do with commitment to a paradigm of work such as STS. The precise relationship between Taylorism and subsequent theories like STS is complex and a matter of debate. However, certainly it appears unnecessary to treat the latter as totally distinct from Taylorism, that is, distinct on all occasions.

> For ... many reorganizations of work are introduced largely in order to overcome production problems in the context of particular product and labour markets. Furthermore, any increases in productivity which follow are explicable not primarily in terms of higher levels of work humanization, but rather in terms of consequent changes in systems and levels of pay and improved coordination of the production system. They also modify certain features of Taylorism and leave others intact, or even reinforce them (Wood, 1987, p. 6).

Work organization cannot be considered out of its environmental context. Certainly this conclusion is supported by much recent research in the field, which suggests that productivity gains from STS are contingent on other factors apart from worker satisfaction (e.g., Locke et al., 1986; Miller and Monge, 1986). The neo-institutionalists Williamson (1985) and Ouchi

(1980), for example, suggest in their market failures theory that organizational form is not an independent factor but rather is dependent upon level of technology or task complexity. Although this seems unlikely in all cases (Dugger, 1987), these authors argue convincingly that efficiency is usually greatest where organizational form (e.g., teamwork versus atomized hierarchy in their polar forms) corresponds to task complexity. As complexity increases, they argue that organizational form progresses through market mechanisms, to bureaucracy, and ultimately to forms of clan exchange, which are similar to teams or autonomous work groups. The STS adherents have so far not contended with this new sophisticated kind of theory base. A great deal more work in this area seems required in order to determine factors which contribute to the process on the one hand, and to the practice on the other, of choices of work organization and their relation to theory in industry. In the meantime it is not difficult to understand the ambivalent reactions of many of those, especially workers in this instance, who are to be subject to such mechanistically controlling work organization decisions.

Another interesting area of conceptual research which has been stimulated at least in part by the STS and QWL experience has been in understanding what the term «control» — a crucial dimension of STS thought — means within organizations. Wood (1987, p. 6) suggests that there has been a tendency to conceive of control in uni-dimensional and zero-sum terms, leading to a rather sterile debate about the impact of participatory and job enrichment projects on balances of control between workers and managers. Does giving workers more control over their work, for example its pacing and output and the use of their time as is advocated in STS organizations, mean that managers have any less control? If not, and if management techniques ensure that control is internalized and made «subjective» within workers' consciousness rather than being enforced from without, then how does this affect the conceptualization of power and control in organizations under different forms of organization? How can worker control and managerial control be compared when, as Kelly (1985, p. 44) states, the many different mechanisms and dimensions of work organization ensure that they often appear to be incommensurate and in some ways independent variables? We return to the suggestion made by class theorists that an intervening variable in the relations among worker control, management control and outcomes of QWL and efficiency is worker skill, which may modify the absolute level of control to be shared between workers and managers in as yet unexplored ways (e.g., Wood, 1987). Since the notion of control is so important to the STS approach, these questions appear to point out productive new directions for research. For example, the literature on power so far appears to have failed to take into account the implications of different forms of work organization such as

STS on relations in organizations, at least in terms similar to those that have been proposed here. If general acceptance and trust of the STS approach is to be improved, these questions also surely require further exploration.

CONCLUSION

This discussion indicates that there is still much research to be done regarding the limits of STS and the impact on efficiency and production and transactions costs of the interactions between the technological characteristics of production on the one hand and the social arrangements of production within organizations on the other. The preceding has been an attempt to point out some of the conceptual and practical problems which appear worth further study as ways of understanding the relative imperviousness up until now of economic institutions to STS. It is suggested that unless STS advocates begin to contend with the internal inconsistencies, lacunae, confusions and contradictions within the theory, which have contributed to problems in its implementation, it stands little hope of becoming acceptable to workers and managers in the near term. In particular, it seems to need to commit itself to a priority of worker needs over technical efficiency in firms. However, this is likely to be a prospect that makes a continuing reliance on Taylorist control mechanisms nearly inevitable, since such a priority assumes that managers are willing to take the risk that efficiency in a firm is compatible with a significant degree of worker control. Without guarantees that such is the case, employers will likely continue the Taylorist approach. As discussion of the political and economic factors in resistance to STS proceeds in the discourse, the importance of these conceptual dimensions will also no doubt be further elaborated.

BIBLIOGRAPHY

AXELROD, Robert, *The Evolution of Cooperation,* New York, Basic Books, 1984.

ARMSTRONG, P., «Competition Between the Organizational Professions and the Evolution of Management Control Strategies», in K. Thompson (ed.), *Work, Employment and Unemployment,* Milton Keynes, Open University Press, 1984.

BARKIN, Solomon, «The Current Unilateralist Counterattack on Unionism and Collective Bargaining», in *Relations Industrielles/Industrial Relations,* vol. 41, no. 1, 1986, pp. 3-27.

————, «The Flexibility Debate in Western Europe: The Current Drive to Restore Managements' Rights Over Personnel and Wages», in *Relations Industrielles/Industrial Relations,* vol. 42, no. 1, 1987, pp. 12-43.

BELL, Daniel, *The Cultural Contradictions of Capitalism,* New York, Viking, 1976.

BENSON, J. Kenneth, ed., *Organizational Analysis: Critique and Innovation,* Beverly Hills, Sage, 1977.

BOWLES, Samuel and Herbert GINTIS, *Democracy and Capitalism: Property, Community and the Contradictions of Modern Social Thought,* New York, Basic Books, 1986.

BRAVERMAN, Harry, *Labour and Monopoly Capital: The Degradation of Work in the Twentieth Century,* New York, Monthly Review Press, 1974.

CHERNS, Albert, «The Principles of Sociotechnical Design», in *Human Relations,* Vol. 29, No. 8, 1976, pp. 783-792.

CLEGG, Stewart and David DUNKERLEY, *Organization, Class and Control,* London, Routledge and Kegan Paul, 1980.

COUSINS, Christine, *Controlling State Welfare: A Sociology of State Welfare Work and Organizations,* New York, St. Martin's Press, 1987.

DAHL, Robert, *Dilemmas of Pluralist Democracy: Autonomy Versus Control,* New Haven, Yale University Press, 1982.

————, *A Preface to Economic Democracy,* Berkeley, University of California Press, 1985.

DAVIS, Louis E., «Learnings from the Design of New Organizations», in H. Kolodny and H. Van Beinum (eds.), *The Quality of Working Life and the 1980s,* Chapter 8, Toronto, Praeger, 1983.

DE BRESSON, Chris, «The Evolutionary Paradigm and the Economics of Technological Change», in *Journal of Economic Issues,* Vol. XXI, No. 2, June 1987, pp. 751-762.

DUGGER, William M., «Review of Oliver Williamson», *The Economic Institutions of Capitalism, Journal of Economic Issues,* Vol. XXI, No. 1, March 1987, pp. 528-530.

FRANCIS, Arthur, Jeremy TURK and Paul WILLMAN, *Power, Efficiency and Institutions: a Critical Appraisal of the 'Markets and Hierarchies' Paradigm,* London, Heinemann, 1983.

GONICK, Cy, *The Great Economic Debate,* Toronto, Lorimer, 1987.

GRANT, George, *Technology and Empire,* Toronto, Anansi, 1969.

————, *Technology and Justice,* Toronto, Anansi, 1986.

HALPERN, Norm, «Novel Organization Working at Shell Canada Facility», in *Oil and Gas Journal,* March 25, 1985, pp. 88-93.

KELLY, J., «Management's Redesign of Work: Labour Process, Product Market and Labour Market», in D. Knights, H. Willmot and D. Collinson, *Job Redesign,* Aldershot, Gower, 1985.

KLEIN, Philip A., «Economic Activity and the Public Sector: Is Small Beautiful?», in *Journal of Economic Issues,* Vol. XIX, No. 2, June 1984, pp. 419-428.

————, «Institutionalism and the New Classical Economics», in *Journal of Economic Issues,* Vol. XX, No. 2, June 1986, pp. 313-323.

KOLODNY, Harvey F. and Moses N. KIGGUNDU, «Towards the Development of a Sociotechnical Systems Model in Woodlands Mechanical Harvesting», in *Human Relations,* Vol. 33, Number 9, 1980, pp. 623-645.

————, From a discussion led by Professor Kolodny in the Ph.D. class «New Directions in Organizational Research», Faculty of Business, University of Toronto, Spring 1987.

KORPI, Walter, *The Democratic Class Struggle,* London, Routledge and Kegan Paul, 1983.

KUTTNER, Robert, *The Economic Illusion: False Choices Between Prosperity and Social Justice,* Boston, Houghton Mifflin, 1984.

LEIBENSTEIN, Harvey, *Beyond Economic Man: A New Foundation for Economics,* Cambridge, Mass., Harvard University Press, 1976.

————, *Inside the Firm: The Inefficiencies of Hierarchy,* Cambridge, Mass., Harvard University Press, 1987.

LOCKE, Edwin, David M. SCHWEIGER and Gary P. LATHAM, «Participation in Decision-Making: When Should it Be Used?», in *Organizational Dynamics,* Winter 1986, pp. 65-79.

MACPHERSON, C.B., *Democratic Theory,* Oxford, Oxford University Press, 1973.

MANZ, Charles C. and Henry P. SIMS Jr., «Leading Self-Managed Groups: A Conceptual Analysis of a Paradox», in *Economic and Industrial Democracy,* Vol. 7, 1986, pp. 141-165.

MATON, Robert F., «Social Work and the Labour Process: A Defense of Braverman», in *Canadian Review of Social Policy,* No. 17, January 1987, pp. 17-21.

MAYHEW, Anne, «Culture: Core Concept Under Attack», in *Journal of Economic Issues,* Vol. XXI, No. 2, June 1987, pp. 587-604.

————, «The Beginnings of Institutionalism», in *Journal of Economic Issues,* Vol. XXI, No. 3, September 1987a, pp. 971-998.

MCCLINTOCK, Brent, «Institutional Transaction Analysis», in *Journal of Economic Issues,* Vol. XXI, No. 2, June 1987, pp. 673-681.

MILLER, Katherine and Peter R. MONGE, «Participation, Satisfaction and Productivity: A Meta-Analytic Review», in *Academy of Management Journal,* Vol. 29, No. 4, 1986, pp. 727-753.

MISHRA, Ramesh, *The Welfare State in Crisis: Social Thought and Social Change,* Brighton, Sussex, Wheatsheaf, 1984.

MORTON, Desmond, «Quality of Working Life May No Longer Be a Bargaining Chip, But Workplace Democracy and Cooperation Are Worthy Ideals», in *The United Church Observer,* April 1987, p. 43.

MUMFORD, Enid, «Participative Systems Design: Practice and Theory», in *Journal of Occupational Behaviour,* Vol. 4, 1983, pp. 47-57.

NIGHTINGALE, Donald, *Workplace Democracy: An Inquiry Into Employee Participation in Canadian Work Organizations,* Toronto, University of Toronto Press, 1982.

OUCHI, William G., «Markets, Bureaucracies and Clans», in *Administrative Science Quarterly,* Vol. 25, 1980, pp. 129-141.

ROTHSCHILD, Joyce and Raymond RUSSELL, «Alternatives to Bureaucracy: Democracy Participation in the Economy», in *Annual Review of Sociology,* 12, 1986, pp. 307-28.

ROTHSCHILD-WHITT, Joyce and J. Allen WHITT, «Worker-Owners as an Emergent Class: Effects of Cooperative Work on Job Satisfaction, Alienation and Stress», in *Economic and Industrial Democracy,* Vol. 7, 1986, pp. 297-319.

SASHKIN, Marshall, «Participative Management is an Ethical Imperative», in *Organizational Dynamics,* Spring, 1984, pp. 5-22.

————, «Participative Management Remains an Ethical Imperative», in *Organizational Dynamics,* Spring, 1986, pp. 62-75.

TAYLOR, James C. and Robert A. ASADORIAN, «The Implementation of Excellence: STS Management», in *Industrial Management,* July-August, 1985, pp. 5-15.

TRIST, Eric L. and K.W. BAMFORTH, «Some Social and Psychological Consequences of the Longwall Method of Coal-Getting», in *Human Relations,* 4, 1951, pp. 3-38.

————, «The Evolution of Socio-Technical Systems: A Conceptual Framework and an Action Research Program», Occasional Paper No. 2, June, 1981, Ontario Quality of Working Life Centre.

WEIERMAIR, Klaus, «Heterogeneity in Production and Organization Design: Comparative Economic Perspectives of Organizational Innovativeness», Unpublished ms., Faculty of Administrative Studies, York University, Toronto, Canada, 1984.

————, «On the Economics of Institutional Change: An Institutional Change in Economics?», in *Journal of Economic Issues,* Vol. XX, No. 2, June 1986, pp. 571-582.

WELLS, Donald, *Soft Sell: Quality of Working Life Programs and the Canadian Productivity Race,* Ottawa, Canadian Centre for Policy Alternatives, 1986.

WILLIAMSON, Oliver E., *The Economic Institutions of Capitalism,* New York, The Free Press, 1985.

WOOD, Stephen, «The Deskilling Debate, New Technology and Work Organization», in *Acta Sociologica,* Vol. 30, No. 1, 1987, pp. 3-24.

Problèmes conceptuels et de mise en oeuvre des systèmes socio-techniques

Le taylorisme, ou la méthode d'organisation scientifique du travail et de la production, destiné à porter au maximum l'efficience au sein des entreprises, a subi en ces derniers temps des pressions de plus en plus fortes, parce qu'il ne réussissait plus à leur permettre de surmonter ni la complexité technique croissante ni le mouvement de la production et du marché non plus que les aspirations des travailleurs de plus en plus sophistiquées et enclins à exiger des relations démocratiques avec les employeurs. Plusieurs chercheurs et praticiens versés dans le domaine des affaires ont proposé les systèmes socio-techniques (SST) comme une alternative capable de répondre aux exigences du taylorisme. Les SST proposent de remplacer les rapports humains rigides et limités des entreprises taylorisées par des relations fécondes plus démocratiques et plus souples. L'instauration du travail en équipe, une égalité plus forte au sein du personnel, une hiérarchisation plus souple, une responsabilité plus grande chez les salariés (plutôt que chez les contremaîtres) en ce qui a trait à la rapidité d'exécution et à la qualité, de même que la volonté d'adapter la technologie de manière à satisfaire les employés, constituent des moyens d'améliorer l'efficacité qui rendent les travailleurs plus intéressés aux méthodes de travail, plus satisfaits dans leurs tâches, plus loyaux envers l'entreprise, plus désireux de s'adapter à la nouvelle technologie et aussi plus favorables à l'accepter comme moyen d'accroître leur rendement. Les SST différencient ce qui est social et ce qui est technique. Ils soumettent qu'il doit y avoir des modifications et un nouvel équilibrage plus ou moins symétrique entre les aspirations des travailleurs et les exigences technologiques de façon que chacun de ces éléments ait une priorité à peu près comparable.

Cependant, le présent article souligne que l'engagement à satisfaire les aspirations des salariés comme moyen d'accroître l'efficacité au lieu de constituer une fin en soi, pourrait entraîner chez les employés une certaine méfiance et miner leurs désirs de rendement et de collaboration. Accorder une priorité plus grande à l'efficacité signifie essentiellement que les besoins des travailleurs deviennent secondaires et qu'il faut davantage d'ajustements à l'intérieur du cadre social pour que les exigences techniques deviennent la règle plutôt qu'un simple engagement à adapter la technologie aux aspirations du personnel. Le présent article insiste aussi sur la nécessité de garder présente à l'esprit l'idée que, même si, idéalement, les SST préconisent de s'intéresser également aux besoins des salariés, leur objectif explicite de considérer l'efficacité comme critère de succès les amènent à n'accorder en pratique qu'un rôle secondaire aux aspects sociaux de la vie de l'entreprise. On a soutenu que cette attitude ambiguë, pour ne pas dire négative, contrarie les employeurs et surtout les travailleurs. Cela explique peut-être qu'on ne trouve que peu de ces systèmes dans les industries malgré ses perspectives révolutionnaires de satisfaire à la fois le désir des employeurs d'augmenter l'efficacité et de permettre aux employés de se sentir plus heureux au travail. Ces derniers y voient davantage de nouveaux moyens de contrôler leur activité qu'une alternative véritable au taylorisme.

La confirmation d'une telle conclusion a plusieurs causes, quelques-unes empiriques et quelques autres conceptuelles ou théoriques. D'une façon pratique, on estime que les changements introduits par les entreprises pour donner satisfaction aux aspirations des salariés sont fort superficiels, par exemple, quand on installe les stationnements à l'intérieur des barrières de l'usine ou qu'on rend les salles de toilette accessibles à tous les membres de l'organisation sans égard à leur rang. Il faut aussi noter que les preuves d'amélioration du rendement attribuable aux SST sont ambiguës. Les SST ont plus de succès dans les établissements nouveaux ou dans les entreprises où il n'y a pas eu de conflits, ce qui élimine presque toute l'industrie actuelle en Amérique du Nord en tant qu'endroits possibles d'implantation de pareils systèmes présentement.

Les raisons théoriques du peu de recours aux SST tirent leur origine de la situation politique en général, de l'économie politique même, et de l'analyse conceptuelle qu'en fait l'entourage. D'un point de vue politique, les SST ont été victimes des luttes idéologiques pour les dominer de la part des employeurs et des travailleurs au niveau international, ce qui tend à raffermir le taylorisme. Dans la perspective de l'économie politique, les taux élevés de chômage semblent créer l'insécurité parmi les travailleurs, ce qui les portent à résister aux changements technologiques. Cela est aussi de nature à nuire à leur développement.

Dans le milieu de travail, ces systèmes présentent plusieurs contradictions et plusieurs inconséquences. Ainsi, la notion de surveillance au sein des entreprises n'est pas claire. Quelques auteurs soulignent que si les salariés travaillant en équipe sont nominalement autonomes à l'intérieur du groupe, il n'en reste pas moins qu'ils sont surveillés par ceux qui les entourent. D'autres estiment que l'hypothèse selon laquelle le partage du pouvoir est un match nul entre les employeurs et les travailleurs est fausse. Le comportement du travailleur a tendance à modifier les moyens de contrôle de bien des façons qu'on est loin de connaître encore. De même, l'opinion suivant laquelle ces systèmes favorisent les ajustements nécessaires à un milieu de travail agité pourrait ne pas se justifier étant donné que les travailleurs sont choisis, «acculturés» et socialisés de façon à établir un certain conformisme et à nuire à l'initiative, ce qui peut, plus que le contraire, affaiblir l'évolution de l'adaptabilité et la créativité. Les systèmes soulèvent aussi des questions au sujet du véritable degré de démocratie dans l'entreprise et au sujet de l'influence que les entreprises peuvent avoir dans le milieu social environnant.

Enfin, on peut se demander si ces systèmes sont vraiment une alternative au taylorisme ou plutôt un simple changement. On estime qu'un véritable progrès doit découler de la volonté profonde de répondre d'abord aux aspirations des travailleurs par delà la technologie si l'on veut que les salariés acceptent ces systèmes qui, peut-être, par la suite, pourront contribuer à l'avancement réel de l'efficacité.